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May 27, 1997
RC-97-0111

Document Control Desk
U. S. Nuclear Regulatory Commission
Washington, DC 20555

Gentlemen:

Subject: VIRGIL C. SUMMER NUCLEAR STATION (VCSNS)
DOCKET NO. 50/395
OPERATING LICENSE NO. NPF-12
Licensee Event Report, (LER 970002)

Attached is Licensee Event Report No. 970002 for the Virgil C. Summer Nuclear Station. This report is submitted pursuant to the requirements of 10CFR50.73(a)(2)(iv).

Should you have any questions, please call Mr. Michael J. Zaccone at (803) 345-4328.

Very truly yours,


Gary J. Taylor

NJE/GJT
Attachment

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RTS (LER 970002, CER 970381)
File (818.05, 818.07)
DMS (RC-97-0111)

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PDR ADOCK 09000395
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NUCLEAR EXCELLENCE - A SUMMER TRADITION!

NRC FORM 568
(4-79)

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY CIRCULAR 150-6194
EXPENSE 040000

LICENSEE EVENT REPORT (LER)

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THE MANDATORY INFORMATION COLLECTION REQUEST 580 HAS REPORTED LESSONS LEARNED ARE INCORPORATED INTO THE LICENSING PROCESS AND FED BACK TO INDUSTRY. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (7-4 F23) U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20545-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0105), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)

Virgil C. Summer Nuclear Station

SOCKET NUMBER (2)

05000395

PAGE (3)

1 OF 5

TITLE (4)

Automatic Reactor Trip; Turbine Trip and Feedwater Isolation

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	DECIMAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	SOCKET NUMBER
0	4	26	97	97	002	0	05	27	97	05000
OPERATOR'S CODE (9)			THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 15. (Check one or more) (11)							
1			20.2201(5)			20.2203(a)(2)(M)			50.73(a)(2)(I)	
POWER LEVEL (10)			20.2203(a)(1)			20.2203(a)(3)(I)			50.73(a)(2)(4)	
6			20.2203(a)(2)(M)			20.2203(a)(3)(M)			50.73(a)(2)(4)	
			20.2203(a)(2)(M)			20.2203(a)(4)			X 50.73(a)(2)(M)	
			20.2203(a)(2)(M)			50.36(a)(1)			50.73(a)(2)(M)	
			20.2203(a)(2)(M)			50.36(a)(2)			50.73(a)(2)(M)	
									OTHER	
									Specify in Abstract below or in NRC FORM 568A	

LICENSING CONTACT FOR THIS LER (12)

NAME

April R. Rice, Manager, Nuclear Licensing & Operating Experience

TELEPHONE NUMBER (NIGHT AND CELL)

(803) 345-4232

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC

SUPPLEMENTAL REPORT EXPECTED (14)

YES (If yes, complete EXPECTED SUBMISSION DATE)	NO	EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR
X					

ABSTRACT (Limit 151400 spaces, i.e., approximately 15 single-spaced typewritten lines) (15)

On April 26, 1997, at 2043 hours, a main turbine trip from 42% power occurred due to a Hi-Hi Lvl in "C" steam generator (P-14) signal. This signal also generated a feedwater isolation, causing all main feedwater (FW) pumps to trip, and sent a signal for the feedwater isolation valves (FWIVs), feedwater regulation valves (FRVs), and feedwater regulation bypass valves (FRBVs) to close. Although emergency feedwater pumps auto started upon loss of all main FW pumps, this flow could only meet the steam demand for about 4% power. At 2047 hours, an automatic reactor trip from approximately 6% reactor power occurred due to Lo-Lo Lvl in "A" steam generator (S/G) during the power reduction. All systems functioned per design in response to this trip. After verification of system integrity and proper plant response, plant restart was initiated.

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TEXT (If more space is required, use additional copies of NRC Form 388A) (17)

PLANT IDENTIFICATION

Westinghouse - Pressurized Water Reactor.

EQUIPMENT IDENTIFICATION

None affected.

IDENTIFICATION OF EVENT

Automatic Reactor Trip Due to Lo-Lo Lvl "A" S/G; Feedwater Isolation Signal generated from Hi-Hi Lvl "C" S/G.

EVENT DATE

April 26, 1997.

REPORT DATE

May 27, 1997.

This report was initiated by CER 970381.

CONDITIONS PRIOR TO EVENT

MODE 1 - 42% Reactor Power.

Power increases from 30% to 42% reactor power at 3% per hour were in progress while the Master Feed Pump Controller was being operated in the manual mode. FW to STM header differential pressure (delta-p) lowered, but was still indicating within the control band. The feedwater flow control valves (FWVs) compensated for low delta-p and increased feed demand by automatically opening. S/G levels were noted to be slightly below program, so the FW pump master controller was adjusted to increase both delta-p and the FW flow to the S/Gs. Due to the open demand previously generated from the control signal, the FWV automatic controls responded slowly to rapidly increasing S/G levels, and at 70% S/G level, manual control was initiated to reduce flow through all three FWVs. A main turbine trip occurred at 2043 hours from 42% power due to a P-14 (Hi-Hi Lvl in "C" S/G) signal. This signal also generated a feedwater isolation, causing all main feedwater (FW) pumps to trip, and sent a signal for the feedwater isolation valves (FWIVs), feedwater regulation valves (FRVs), and feedwater regulation bypass valves (FRBVs) to close.

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DESCRIPTION OF EVENT

On April 26, 1997, at 2043 hours, a main turbine trip from 42% power occurred due to a Hi-Hi Lvl in "C" steam generator (P-14) signal. This signal also generated a feedwater isolation signal, causing all main feedwater (FW) pumps to trip, and sent a signal for the feedwater isolation valves (FWIVs), feedwater regulation valves (FRVs), and feedwater regulation bypass valves (FRBVs) to close. At 2047 hours, an automatic reactor trip from approximately 6% reactor power occurred due to Lo-Lo Lvl in "A" steam generator (S/G) during the power reduction. All systems functioned per design in response to this trip. After verification of system integrity and proper plant response, plant restart was initiated.

CAUSE OF EVENT

The Hi-Hi Lvl turbine trip was the result of a failure to adequately compensate for uncertainties associated with feedwater and main steam pressure indication. The procedural guidance provided to the operators and a failure to utilize alternate indications of delta-p resulted in a FW flow transient which caused the Hi-Hi Lvl turbine trip. The automatic reactor trip occurred at 6% power due to Lo-Lo Lvl on "A" S/G during the power reduction following a feedwater isolation generated from the Hi-Hi Lvl in "C" S/G.

ANALYSIS OF EVENT

Power increases from 30% to 42% reactor power at 3% per hour were in progress while the Master Feed Pump Controller was being operated in the manual mode. FW to STM header differential pressure (delta-p) lowered, but was still indicating within the control band. The feedwater flow control valves (FRVs) compensated for low delta-p and increased feed demand by automatically opening. S/G levels were noted to be slightly below program, so the FW pump master controller was adjusted to increase both delta-p and the FW flow to the S/Gs. Due to the open demand generated from the control signal, the FRV automatic controls responded slowly to rapidly increasing S/G levels, and at 70% S/G level, manual control was initiated to reduce flow through all three FRVs. However, at 2043, a Hi-Hi Lvl turbine trip was generated due to "C" S/G level. This signal also generates a feedwater isolation, resulting in the trip of all main feedwater (FW) pumps, and sends a signal for the feedwater isolation valves (FWIVs), feedwater regulation valves (FRVs), and feedwater regulation bypass valves (FRBVs) to close. The duration of the feedwater isolation signal was less than one second, which resulted in the closure of only the "A" S/G FWIV. Reactor power was rapidly decreased following the

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ANALYSIS OF EVENT (Continued)

turbine trip from less than 50% power. Although emergency feedwater pumps auto started upon loss of all main FW pumps, this flow could only meet the steam demand for about 4% power. An automatic reactor trip occurred at 6% power due to Lo-Lo Lvl on "A" S/G during the power reduction. The Lo-Lo Lvl in "A" S/G was caused by the steam flow exceeding the available feedwater flow due to the "A" FWIV closure which occurred due to the feedwater isolation signal generated from the Hi-Hi Lvl in "C" S/G. The Hi-Hi Lvl turbine trip was the result of a failure to adequately compensate for uncertainties associated with feedwater and main steam pressure indication. The procedural guidance provided to the operators and a failure to utilize alternate indications of delta-p resulted in a FW flow transient which caused the Hi-Hi Lvl turbine trip. The feedwater control system design requires a combination of pump speed control for adequate delta-p and control valve position in order to maintain proper feedwater flow control. Procedural guidance provided to the operator directed maintaining feedwater delta-p at 150% during initial system startup using manual control, and subsequently reducing delta-p to the program setting prior to placing controls in automatic. The procedural guidance did not specifically account for uncertainties associated with the use of main control board indication to ensure an adequate delta-p was being maintained while in manual control. The operator's actions to maintain delta-p at the program setting resulted in the FRVs being driven to their full-open position. With the FRVs in this position, they were unable to respond automatically to the increased feedwater flow resulting from an adjustment in feedwater delta-p. The operator's initial response to the increasing S/G level was to allow the FRVs to respond to the increased flow transient in automatic. When S/G levels reached approximately 70%, the operator took manual control of the FRVs and attempted to reduce feedwater flow. This action was not adequate to prevent the Hi-Hi Lvl turbine trip.

IMMEDIATE CORRECTIVE ACTIONS

The following corrective actions were performed:

1. Verified the response of the plant to the feedwater isolation (P-14) signal was per design.
2. Verified the calibration of the Feed and Steam pressure indications used for manual control of feedwater pump delta-p on the main control board.
3. Ensured Operations personnel understanding of the need to maintain feedwater delta-p at an approximately 150% setting during manual operation.

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TEXT (If more space is required, use additional copies of NRC Form 308A) (17)

IMMEDIATE CORRECTIVE ACTIONS (Continued)

4. The licensed operator involved in this event was restricted from licensed duties until the completion of remediation.

ADDITIONAL CORRECTIVE ACTIONS

The following corrective actions are being taken:

1. Procedure changes to be provided to specify more clearly the feedwater delta-p requirements to be maintained during initial power escalation with main feed pump control in manual. GOP-4 will be revised and simulator validation completed to include these requirements by the end of refueling outage 10, scheduled to begin in October 1997.
2. Procedure changes to address the use of the main feed pump master speed controller in manual to reduce feedwater flows upon receipt of high S/G level deviation alarms. Annunciator response procedures for XCP-624, annunciator windows 1-5, 2-5, and 3-5, will be revised to include these requirements by the end of refueling outage 10, scheduled to begin in October 1997.
3. Procedure changes to the abnormal operating procedure (AOP) for response to a turbine trip without a reactor trip to provide the operator with additional guidance for response to a potential feedwater isolation as the result of a turbine trip due to Hi-Hi S/G lvl. AOP-214.1 will be revised and simulator validation completed to include this guidance by the end of refueling outage 10, scheduled to begin in October 1997.
4. Include scenarios utilizing lessons learned from this event in operator training. This action has been scheduled in the next licensed operator requalification cycle, to be completed by July 25, 1997. Additional training needs identified by the procedure changes above will be completed as part of the respective procedure change.

PRIOR OCCURRENCES

None.